

## **Lesson # 5**

**Project: 4-H Club School Enrichment Educational Series**

**Project Manual: Science-Horticulture**

**Grades: 4th-6th**

**Learning Activity: From Soil to Supper**

**Track: Science - Horticulture**

**Life Skills: Keeping records and managing**

**Character Focus: Respect - In competition, it is important that we show **respect** to all participants.**

**Project Skills: Acquiring, processing and interpreting data, analyzing investigations**

### **Louisiana Content Standards Benchmarks and Grade Level Expectations:**

**SE-M-A3** Describe how humans have had negative and positive effect on organisms and their environments. Grade 5 - 49. Identify and give examples of pollutants found in water, air, and soil

**SE-M-A4** Describe the consequences of several types of human activities on local ecosystems. 5<sup>th</sup> grade - 50. Describe the consequences of several types of human activities on local ecosystems (e.g., polluting streams, regulating hunting, introducing nonnative species)

**SE-M-A8** Identify and analyze the environmental impact of humans' use of technology (energy production, agriculture, transportation, human habitation). 7<sup>th</sup> grade - 47. Illustrate how various technologies influence resource use in an ecosystem (e.g., forestry management, soil conservation, fishery improvement)

**Time Allotted: 35-45 minutes**

**Number of Participants: small or large groups**

#### **Key Concepts:**

1. Plants need fertilizer to grow.
2. Three major elements are found in fertilizer.
3. Organic and inorganic fertilizers are very different and are used in different plantings.
4. Observing outward symptoms in plants can help us know when plants have insufficient levels of nitrogen, phosphorous and potassium

#### **Objective:**

1. Participants will list three reasons why plants need fertilizer.
2. Participants will name and describe the three major elements found in fertilizer, and explain the difference between organic and inorganic fertilizers.
3. Participants will identify condition of three plants according to insufficient levels of nitrogen, phosphorous and potassium.

#### **Getting Ready:**

1. Use Make Believe Garden Game instructions, Resource Sheet #1, p. 9, of this lesson plan. Cut 2"x2" squares of red, yellow and green poster board. (Allow at least two squares of each color per youth.) Mix the squares and place them in a storage container. Follow game instructions on Resource Sheet.

#### **What You Need for the Lesson:**

1. Bags of plant fertilizer, several containers of fertilizer that give different examples of fertilizer amounts. (See a local fertilizer store for donation of materials.)
2. Enough sheets of red, green and yellow poster board cut into 2"x2" squares as described in Getting Ready
3. Pencils, notebooks, scissors, rulers and storage containers

## LESSON PLAN:

What You Say:	What You Show or Do:	What Participants Do:
<p>1. Plants cannot live by sunlight and water alone. They require a balanced diet just as we do; however, plants do not really eat anything. Fertilizers are often called “plant food,” but it is incorrect to label fertilizers as food. Plant roots absorb three vital nutrients from the soil such as <b>nitrogen, phosphorous and potassium</b>. Plants use these nutrients along with several others, in a food- making process called “photosynthesis” --chlorophyll converting light into chemical energy. During this process, plants build all the molecules they need for energy, growth and reproduction. Do you think we need fertilizers to grow food crops?</p> <p>2. Commercial growers must control the plant’s environment to obtain the best plant growth. This often involves improving the soil condition by adding fertilizer. Fertilizer allows food producers to grow the same crops year after year in the same fields. Why do you think fertilizers are used in some locations and not in others? <b>(Possible answers:</b> Some soil is more fertile than others, some soil is more nutrient rich than others, some soil has very few nutrients, etc.)</p> <p>3. A fertilizer is a material that contains one or more of the mineral nutrients required for plant growth. Fertilizers supply</p>	<p>1. Ask the question and elicit responses from the group. Give students time to discuss and reply.</p> <p>2. Give students time to discuss and reply. Solicit responses.</p> <p>3. Show a bag of fertilizer and ask students to find where the numbers and letters are located on the bag.</p>	<p>1. Respond and discuss.</p> <p>2. Respond and discuss</p> <p>3. Locate letters and numbers on fertilizer containers.</p>

What You Say:	What You Show or Do:	What Participants Do:
<p>additional nutrients to the soil. Natural ecosystems can produce enough mineral nutrients to sustain themselves because many nutrients accumulate in soil from the decay of animal and vegetable material. The soil in many other locations is deficient in nitrogen, phosphorous, potassium and other nutrients. That soil may need enrichment before quality crops will grow there. Do you know what the letters and numbers on a fertilizer container represent? <b>(Possible answers:</b> nutrients in it, the amount of nutrients, etc.)</p> <p>4. Letters and numbers (always listed in the same order) on fertilizers show a guaranteed analysis of nitrogen (N), phosphorous (P) and potassium (K) found in the container. The numbers show the percentage by volume of N-P-K found in the fertilizer. For example, if the container is a 100-pound bag of fertilizer with the three numbers 10-10-10, it contains 10 percent nitrogen, 10 percent phosphorous and 10 percent potassium. The other 70 percent is filler material. Why and how do you think plants use nitrogen, phosphorous and potassium?</p> <p>5. Nitrogen has the most noticeable effect on plants. It stimulates above-ground growth, causing plants to produce soft tender growth and dark green leaves.</p>	<p>4. Show participants examples of containers that have fertilizer numbers on them. Ask participants to guess what they stand for.</p> <p>5. Ask if anyone has possibly seen plants that were just described. (pale green, yellow, size differences, etc.) Often lack of nitrogen is what the</p>	<p>4. View containers of fertilizers and guess what the numbers stand for. Listen as leader describes in detail what the numbers stand for.</p> <p>5. Respond to leader with examples.</p>

<b>What You Say:</b>	<b>What You Show or Do:</b>	<b>What Participants Do:</b>
<p>The tender growth makes the plant taste better. Too little nitrogen results in stunted plant growth and pale green or yellow color. Too much nitrogen lowers the plants' resistance to disease, weakens stem growth, causes fruits to be too soft to ship and increases chances for winter damage due to delayed hardness of plant tissue.</p> <p>6. Phosphorus is nicknamed the "flower maker." It is present to some extent in all soil. Phosphorous stimulates root growth, increases plant's resistance to disease, and starts flower and fruit formation. Too little phosphorus generally causes the undersurface of leaves to turn purple. This causes reduced root, flower, fruit and seed production. These plants usually are more likely to be damaged in cold weather and get diseases.</p> <p>7. Potassium is nicknamed the "fruit maker." It stimulates plant starch formation, increases tuber development, increases chlorophyll formation and helps the plant efficiently use carbon dioxide, nitrogen and phosphorous. Lack of potassium causes the plant to fail to grow properly. They have weak stems and, if they flower, the blossoms are small and pale. The leaves on potassium-deficient plants usually appear dry and scorched on the edges with irregular yellow areas on the surface.</p>	<p>plant or garden is experiencing. Solicit responses.</p> <p>6. Ask, have you ever planted a flower that never bloomed or didn't bloom as much as it showed in the picture? This might have been caused by the lack of phosphorous.</p> <p>7. Mark off an area indoors or outdoors that will serve as make-believe garden boundaries. Divide the group by having them count off one-two. The ones will be the weeds and the twos vegetables. Provide a sign made of paper with a large W written on it to be held by students who represent the weeds.</p>	<p>6. Discuss and respond.</p> <p>7. Allow the vegetables to line up in rows evenly spaced in the garden. Weeds will hold up signs with a W on it to show how they randomly fill in spaces among the vegetables.</p>

<b>What You Say:</b>	<b>What You Show or Do:</b>	<b>What Participants Do:</b>
<p>(Experience)</p> <p>8. Now, let's play a game to see just how plants in one garden compete for the nutrients we discussed earlier.</p> <p>The object of the game is for the weeds and vegetables to gather as many squares as they can. But remember, plants are anchored firmly in the ground and cannot move from one location to another by themselves. So, you are not allowed to move your feet as you reach down to pick up the nutrients. If you do, you will be disqualified.</p> <p>9. Each colored square represents a plant nutrient. Green represents nitrogen, yellow represents potassium, and red represents phosphorous. If a vegetable or a weed did not pick up at least two of each nutrient, it "dies."</p> <p>(Share)</p> <p>10. How did you feel about being a weed? (Possible answers: being able to take over, some of the time hard to set up, etc.) A vegetable?</p> <p>How many of each nutrient did you get? What kept you from getting a higher number of each nutrient?</p> <p>Who got more of each nutrient-vegetable or the weeds? Why?</p> <p>(Generalize)</p> <p>Did any plants die because they did not get any nutrients? Why is it important to know that weeds and vegetables compete in gardens? Why is it important to</p>	<p>8. Scatter the 2" x 2" squares on the ground (floor if outside isn't appropriate) around the weeds and vegetables. Give the signal to start the first round.</p> <p>9. Repeat a couple of more rounds and continue to "kill off" plants and weeds.</p> <p>10. Solicit responses.</p>	<p>8. Gather as many nutrients as possible in one 10-second round. Record the number of each nutrient they gathered.</p> <p>9. Continue gathering as many nutrients as possible in 10-second rounds and record the number of nutrients gathered.</p> <p>10. Respond and discuss.</p>

What You Say:	What You Show or Do:	What Participants Do:
<p>know soil's mineral content ?</p> <p>11. What are some ways people compete? How do you feel when you are faced with competition? How well do you perform under pressure? What happens when animals compete for resources? <b>(Possible answers:</b> races, excited, scared, it depends on the performance, often there is anger.)</p> <p>(Apply)</p> <p>12. What can be done to reduce pressure during competition? How will you act differently in the future when you are in a competitive situation? Can you explain competition to someone else?</p> <p>13. In any competition, it is important that we show <b>respect</b> to all participants. We want to win, but we must not win by being disrespectful to other participants. We can show respect in the best way when we treat others the way we would like to be treated.</p>	<p>11. Encourage participants to share answers with a person sitting near them.</p> <p>12. Solicit answers for each question. Encourage students to tell the person sitting next to him/her how they would explain competition.</p>	<p>11. Respond to a partner(s) near their seated area.</p> <p>12. Explain competition to the person sitting next to them.</p>

### Ways to Help Members Learn More:

1. Visit the local garden center and compare the N-K-P composition of commercial fertilizers. Investigate and write about a career in landscape design, greenhouse grower, nursery man, fruit farmer or vegetable grower. Invite local LSUAgriculture agent to come and teach participants how to identify symptoms of plants that have insufficient levels of nitrogen, potassium and phosphorus.

Give each student a copy of the sheet on page 7 of this lesson plan. Instruct them to fill in the chart and blanks and to bring it back at whatever time you would choose to look at their findings.

**PROJECT: FROM SOIL TO SUPPER**

**ACTIVITY SHEET - #1**

**GOING PLACES:**

Visit your local garden center or home store, and locate the fertilizer in the store. See how many different brands and numbers/levels of nitrogen, phosphorous and potassium you can find in a bag of fertilizer. Record your findings.

<b>BRAND</b>	<b>Levels of Nutrients N-P-K</b>	<b>BONUS</b> What type of plant would this fertilizer be good for? (ex. Grass, flowers, fruit, etc.)

**STAYING AT HOME:**

Take a walk around your yard. Where is the grass growing best? poorly? why? What nutrients (N, P or K) would make your grass grow better? Look at the flowers: Where do they grow best? Write what you see below.

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**Resources:**

*Down-to-Earth, Enriching Learning Through Gardening.* NC State University & A&T State University Cooperative Extension.

**Acknowledgments:**

*Louisiana Content Standards Benchmarks, and Grade Level Expectations*, published by Louisiana State Department of Education

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## Resource Sheet #1

# Make Believe Garden Game



### Items Needed:

- 2" x 2" squares - Use construction paper or poster board to make at least 20 or more of each.  
Green – Nitrogen  
Yellow- Potassium  
Red – Phosphorous
- Yarn, hole puncher and construction paper - Make signs with a **W** to represent weeds in the garden. Make at least 20 signs to represent weeds.

**Object of the Game** – The weeds and vegetables gather as many squares (nutrients) as they can within 10 seconds. At least two of each color are needed or they are dead.

1. Participants are given a number of 1 or 2. The ones are weeds, and the twos are vegetables. The weeds wear the signs with the **W** around their necks.
2. Place participants in a make-believe garden area (indoor or outdoor) that is within a boundary.
3. Scatter the 2" x 2" squares on the ground around the weeds and vegetables.
4. Participants aren't allowed to move their feet as they reach down to pick up the needed squares. Remember that at least two of each color are needed when picking up squares.
5. Use a timer or second-hand watch to allow for 10 seconds of gathering as many colored squares as possible. Repeat this activity several times. Each time scatter the squares.

### Upon completion, ask the following questions:

1. How did you feel about being a weed? (It was fun being able to take over, some of the time it was hard to stay alive, etc.)
2. How many of each nutrient did you get? (0, 1, 2, etc.)
3. What kept you from getting a higher number of each nutrient? (They were already taken, not enough, etc.)
4. Who got more of each nutrient the vegetable or the weeds? (Some of the time, the weeds; other times, the vegetables.)
5. Did any plants die because they did not get any nutrients? (Yes, because of the lack of nutrients.)
6. Why is it important to know that weeds and vegetables compete in gardens? (Some weeds will cause the plants to die, etc.)
7. Why is it important to know the mineral content of soil? (It will allow for maximum growth of the plants, etc.)

## **Handout #2**

### ***PROJECT: FROM SOIL TO SUPPER***

#### ***Lesson: Nitty Gritty***

1. Ask your parents where you can dig a hole in your yard or some other area to get a sample of soil.
2. Dig a small hole and fill a sandwich bag with the dirt.
3. Write five descriptive words about the soil.
4. Is the soil in the bag similar to the soil at school? Is it different? Why?
5. Bring your bag of soil to the meeting to compare with other classmates. Look for the differences in the soil in relation as they are from different parts of the town or city.